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Chapter

The Importance of Reduction in the Registry of Deaths to Ill-Defined Causes and their Impact on Mortality Profile: The Brazilian Experience and its Implications to International Health Security

Davi Félix Martins Junior

Abstract

This chapter aims to describe the strategies implemented by the Ministry of Health since 2004 to reduce deaths classified as ill-defined causes (IDC) and the impacts on the mortality profile. Since 1979, deaths occurring and recorded across the country have been stored electronically on the Datasus website (www.datasus.gov.br), which is in the public domain. From this database, it appears that the proportion of deaths from IDC in the country decreased from 20.1% in 1979 to 5.5% in 2017. In small municipalities, less than 20,000 inhabitants, which have the worst data quality and worse socioeconomic status and with the greatest inequities in health, requiring greater investments, the reduction was smaller. The Ministry of Health implemented several actions that involved suspending the transfer of resources from the federal fund to the municipal fund for non-compliance with the rules for the collection, flow and periodicity of information on deaths, in addition to training and qualification of human resources to record and code the causes of death and to investigate deaths by IDC through verbal autopsy. These are initiatives that can be replicated in other contexts, except, perhaps, of a legal nature, as they fit into the legal system that presents specificities in each country.

Keywords: ill-defined causes, mortality information system, mortality statistics, basic cause of death, mortality, time trend, mortality profile

1. Introduction

Mortality is the most used indicator to make inferences about the health conditions of the groups that make up a given population [1], being used, among others, in the analysis of the momentary situation, in the evaluation of trends in the population's health status and surveillance of health and also in proposing effective measures and interventions in public health policies [2] focused on prevention and assistance. The use of mortality to describe the health situation depends

fundamentally on the information contained in the death certificate (DC), highlighting crucial fields that enable a better characterization of death, such as age, gender, marital status and underlying cause or causes associated. Traditionally, the analysis of deaths is presented through a single cause, the basic cause of death [3], not considering the other conditions informed by the doctor in the death certificate. It is noteworthy that in middle- and low-income countries, death registration and cause-of-death determination are not performed for multiple deaths, and the deaths of the poorest individuals are less likely to be reported [4]. In situations where it is not possible to specify the underlying cause of death, the "underlying cause" field is filled in as ill-defined cause (IDC) representing a major gap in the knowledge of the occurrence of the leading causes of death. Deaths from IDC reduce the potential for mortality as a health indicator by underestimating the rates of a disease or group of diseases, thus falsifying the epidemiological reality, directly impacting intervention measures. Mortality statistics should be of quality to reflect the actual pattern of causes of death in the population.

IDC of death is an indicator to assess the quality of information on causes of death and reflect problems of access to health services, quality of health care provided to the population [5], and the characteristics of completing the death certificate [6]. In addition, there is the lack of conditions for the diagnosis of diseases and, on the other hand, professional training for filling out death certificates [7].

Data on deaths occurring and recorded in the country are stored in the Mortality Information System-SIM/Datasus [8], which was created in 1975, and in the following year, the Ministry of Health unified more than 40 models of instruments used in Brazil for data collection mortality data. This system stores death data that allows the generation of cause-specific mortality indicators that serve to analyze and evaluate systems at all levels of management, from municipal to national level. The SIM was computerized in 1979, whose data are available for reading and using when needed on the Datasus website, www.datasus.gov.br [8]. The official document for collecting information on death is the Death Certificate (DC) and its main characteristics are a single and universal model for the entire national territory, and it maintains the international model proposed by the World Health Organization (WHO) in the cause of death part, standardizing the way to record all other types of information [9]. Death certificate is the name of the official form in Brazil, in which death is attested. For legal purposes, death must be registered with the civil registry office of natural persons and can only be obtained with the death certificate [10]. The process of decentralization resulting from the implementation of the Unified Health System (SUS) made the states and municipalities responsible for collecting death data from 1991 onwards [11]. As for the quality of deaths in the country, there is considerable heterogeneity in the causes of death statistics in Brazilian regions, especially for criteria such as completeness and ill-defined causes [12]. These authors found that from 2002 to 2004 coverage varied significantly between regions, from 72 to 80% in the Northeast, compared to 85 to 90% in the Southeast and Midwest, and 94 to 97% in the South. The distribution of proportional mortality by IDC varied, with the highest proportions being in the states located in the less-developed regions of the country, North and Northeast, and the lowest in the states located in the other regions [13, 14]. In Brazil, in 2003, 95% of undeclared deaths occurred in the North and Northeast regions and 76% of the total deaths reported without the cause of death in the country occurred in these regions [15]. The differences found at the regional scale are replicated at the state scale and even at the intra-municipal scale. The differences in the risk of death by this group of causes reflect the inequalities in the living conditions of the populations living in each unit of the federation and

reflect, among others, the degree of access to health services, availability of medical assistance provided to the population and the characteristics of filling out the death certificate [16]. Regarding the completion of the DC, the need for activities aimed at raising the awareness of the medical professional about the relevance of the DC is emphasized, through continuous training actions that allow the complete and correct completion of the document [17]. The importance given to information and the level of organization of health services can be added to these. From the perspective of health security, the occurrence of deaths from ill-defined causes represents a major problem that directly affects the health management process, as this demands the production of continuous, timely information and needs to be sensitive enough to capture the changes in a situation of health. Health policies must be based on adequate and timely information about the nature and extent of the problems observed, their determinants and the impact on populations [16] to plan health services according to the needs of the population. High proportions of reported deaths classified as ill-defined causes can significantly change mortality rates due to specific diseases [18], on the one hand, and constitute a public health risk, on the other, because it may be a disease with a high transmissible power and spread to the entire population from the affected people and their contacts. This risk varies from the local scale to the global scale.

This study aimed to evaluate the reduction in deaths from ill-defined causes on the mortality profile of the Brazilian population from 1979 to 2017.

2. Methods

A time series study with secondary data from the SIM/Datasus/MS Mortality Information System was performed. This system stores data on deaths that occurred and were recorded in Brazil and has been available for reading and using when needed since 1979 on the Datasus website www.datasus.gov.br [8]. The computerization of the death registration through SIM/Datasus has allowed to monitor mortality in the country due to underlying cause or associated causes and also according to some demographic characteristics such as gender and age, and it is also possible to analyze the geographic distribution of deaths, which has a smallest space unit, the municipality. This system is an important management tool in the health area and its management at the federal level is affected by the Health Surveillance Secretariat.

The present study considered ill-defined causes of death allocated in Chapter XVI of the International Classification of Diseases (ICD 09)—Symptoms, Signs and Ill-Defined Diseases and Chapter XVIII of the 10th Review of ICD—Symptoms, Signs and Abnormal Findings, Clinical and Laboratory Examinations (codes R00–R99). We adopt this because among the different initiatives developed by the Ministry of Health with a view to reduce underreporting and the high proportions of deaths from IDC in the North and Northeast regions responsible for the highest proportions of deaths classified under this heading in the country, we highlight the program "Reduction in the percentage of deaths with ill-defined causes." This program was established by the Ministry of Health in 2004 and aimed to reduce the proportion of deaths from Chapter XVIII [19]. Using the number of deaths from ill-defined causes in the numerator and the total number of deaths in the denominator, we calculated proportional mortality from ill-defined causes (IDC) by age group (0–4; 5–19; 20–29; 30–39; 40–49; 50–59; 60+ and total for the period 1979–2017) and by municipality population size (up to 10,000; 10,001–25,000; 25,001–50,000; 50,001–100,000; 100,001–500,000; 500,001– and more, for the years 1996 and

2017). The year 1996 was taken as reference because it was the year in which Brazil adopted the ICD-10 in the classification of causes of death; 1979 is the first year from which data are available for capturing that are stored in SIM and 2017 is the last year in the data series.

3. Results

Figure 1 shows the temporal trend of proportional mortality from ill-defined causes from 1979 to 2017. Rates grew with small swings from 1979 (20.1%) to 1984, the year that reached the highest rate, 22.5%. It then followed a downward trend and last year the rate stood at 5.5%.

The distribution of proportional mortality by IDC according to age group shown in **Table 1** shows that in 1996 the rates ranged from 1.8% in the 5- to 19-year-old group, rising to 2.7% in the subsequent age group and reaching 63.4% in the elderly, people aged 60 and over. In the strata, the lowest rate was observed in young adolescents (7.1%) and the highest in the elderly 18.2%. In 2017, a similar rate in the first two age groups was 1.7%, reaching 3.0% in the 20–29 age group and 68.2% in the elderly. The distribution of rates in the strata ranged from 2.9% in children aged 0–4 years to 6.0% in the age group of 40–49 years. There was a significant reduction in the proportion of deaths from IDC of around 63.7% and ranged from 44.6% in the 30–39 age group to 78.4% in children. In the 2 years under analysis, the elderly (60 years and over) accounted for the highest proportion of deaths from CDM, 63.4% in 1996, rising to 68.2% in 2017.

In 1996, there were 4974 municipalities in the country, of which 2195 (44.1%) had up to 10,000 inhabitants and whose proportion of deaths from ill-defined causes was of the order of 26.8% (**Table 2**). The municipalities with up to 25,000 inhabitants registered the highest proportional mortality by IDC, 29.8%, decreasing then with the increase in the population size, reaching the rate of 6.7% in the most populous municipalities. Due to multiple breakdowns, the number of municipalities in the country has grown to 5571 units. Of the 5571 municipalities in the country, in year 2017, 2450 (44.0%) had up to 10,000 inhabitants, and the proportion of deaths from IDC was 6.4%. Proportional mortality by IDC in 2017 ranged from 5.0% in the largest municipalities (500,001 thousand inhabitants and

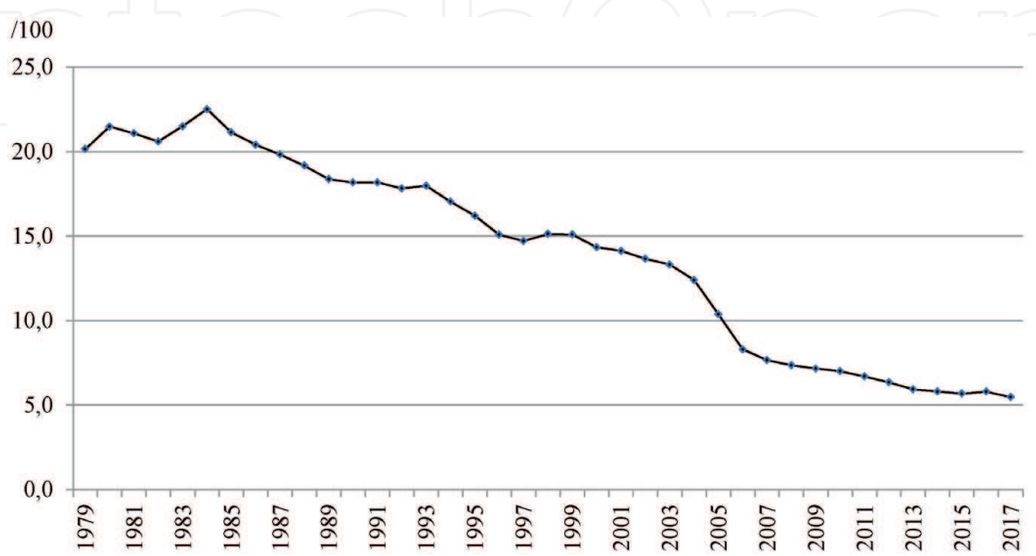

Figure 1.
Mortality rate from ill-defined causes, Brazil, 1979–2017; source: SIM/Datasus.

Age range	1996			2017			Var %
	N° total of deaths	% death IDC in extract	% IDC in total	N° total of deaths	% ób IDC in extract	% ób IDC in total	2017/1996 in extract
0–4	87.769	13,5	8,6	42.141	2,9	1,7	−78,4
5–19	31.749	7,6	1,8	29.376	4,0	1,7	−46,7
20–29	52.380	7,1	2,7	55.755	3,9	3,0	−45,4
30–39	65.770	10,0	4,8	63.776	5,6	4,9	−44,6
40–49	80.820	12,3	7,3	89.177	6,0	7,5	−51,0
50–59	102.738	13,2	9,9	153.293	5,6	12,0	−57,4
60 and more	477.765	18,2	63,4	876.178	5,6	68,2	−69,3
Total	908.883	15,1	100,0	1.312.663	5,5	100,0	−63,7

Source: SIM/Datasus. 1996, the year that ICD-10 was adopted in the codification of diseases; 2017, the last year with available mortality data.

Table 1.
Proportional mortality due to ill-defined causes and temporal variation according to age group, Brazil, 1996 and 2017.

Population	1996			2017			Var %
Category	Death IDC	Death total	%	Death IDC	Death total	%	2017/1996
Up to 10,000	15.297	57.132	26.8	5.558	86.664	6.4	−76.0
10,001–25,000	37.316	125.172	29.8	12.679	171.860	7.4	−75.3
25,001–50,000	27.068	102.481	26.4	10.794	156.397	6.9	−73.9
50,001–100,000	21.177	109.533	19.3	9.820	154.669	6.3	−67.2
100,001–500,000	28.526	223.568	12.8	18.465	343.437	5.4	−57.9
500,001 and more	18.813	282.609	6.7	85,834	1.709.365	5.0	−24.6
Total	148.197	900.495	16.5	143.150	2.622.392	5.5	−66.8

Source: SIM/Datasus. 1996, the year that ICD-10 was adopted in the codification of diseases; 2017, the last year with available mortality data.

Table 2.
Proportional mortality due to ill-defined causes and percentage variation according to population size classes, Brazil, 1996 and 2017.

more) to 7.4% in the municipalities with a population of 10,001 to 25,000 inhabitants. The proportion of deaths from IDC decreased in all population strata, being greater than 70% in municipalities with up to 50,000 inhabitants, which is higher than the national average of 66.8% (from 16.5% in 1996 to 5.5% in 2017). In the large municipalities, the reduction was around 24.6% (6.7% to 5.0%).

4. Discussion

Brazil is the largest country in South America with significant regional socioeconomic differences affecting the living and working conditions in which individuals and the population group live and which are directly related to their health

situation, that is, configuring the social determinants of health [20]. These adverse conditions cause health problems and create situations of potential risk, affecting the health of individuals and certain segments of the population. Significant differences are also observed in the organization and structuring of public services that affect, among others, the registration of vital information, whether due to lack of coverage or problems in filling out the forms related to this information. Given the situation identified in recent decades, the federal government, through the Ministry of Health, has made significant investments in various initiatives aimed at improving the quality of vital information in the country. Regarding deaths, attention has been focused on improving the coverage of deaths and reducing, to the maximum, the number of deaths classified under the heading of ill-defined cause.

Investments made include the regulation of data collection, flow and periodicity of information on death by means of Ordinance No. 116 of February 11, 2009 [21], and the suspension of fund-to-fund transfer in the event of problems in submitting this information, initially through Ordinance GM 3252 of December 22, 2009 [22], and currently Ordinance No. 1378/GM/MS of July 9, 2013 [23].

In addition to these decrees, training programs for human resources and coders of basic causes are associated with the dissemination of data and technical publications, such as "Saúde Brasil," based on the use of data from information systems, thus seeking greater use of indicators of health by managers [24]. Another important initiative was the study of the active search for deaths and births in the Northeast and the Legal Amazon with the main objective of estimating the coverage of the Mortality Information System (SIM) and the Information System on Live Births (SINASC) in 133 municipalities of these regions. The statistical procedure used for data analysis allowed the estimation of infant mortality in all municipalities [25].

Regarding the improvement of the definition of the cause of death, the program "Reduction of the percentage of deaths with ill-defined causes" was instituted in 2004, developed by the Health Surveillance Secretariat of the Ministry of Health. This program aimed to investigate deaths from ill-defined causes and establish a goal to reduce the percentage of these deaths in the Northeast region and in three states in the North region (Acre, Pará and Amazonas) to less than 10% [26]. In 2006, the National Network of Mortality Cause Verification and Death Verification Services (SVO) was created considering the need for the implementation of SVO in all state capitals and the Federal District, which should total 74 services [27] to insert these structures on the National Health Surveillance System. In addition, a new instruction manual to fill a DC from 2011 was widely disseminated and distributed, seeking greater awareness of the medical professional regarding the importance of correct and complete filling of this document [9].

The creation of Hospital Epidemiology Centers (NUHEPI), within the hospital, and the Epidemiological Surveillance Units (UVE), in Family Health Centers, as well as the implementation of the form to investigate deaths from ill-defined causes, the training of typists and coders, and awareness-raising workshops for professionals responsible for filing a DC from 2006 onwards, represented a major contribution to this new reality [16].

All measures of a legal nature, by suspending the transfer of funds from the federal fund to the municipal fund, in case of non-compliance with the rules for the collection, flow and periodicity of information on deaths, in addition to training and qualification of human resources to record and code the underlying cause and to investigate deaths by IDC through verbal autopsy, reduced the occurrence of deaths classified as IDC. According to data presented in this article, there is a pronounced reduction in ill-defined causes for the country as a whole, which proves the effectiveness of this set of actions. These are initiatives that can be replicated in

other contexts with the exception, perhaps, of a legal nature, as they fall within the legal system that presents specificities in each country. Among the limitations of this study is the unit of analysis that considered the country as a whole. The use of a smaller spatial unit as a microregion or even a municipality would make it possible to identify the municipalities where the impact of the actions did not achieve the expected success, that is, where the problems of assistance, registration and classification of deaths persist.

5. Conclusion

The unequal distribution of deaths according to underlying cause expresses the inequity of access to health services by the population and problems of structuring and organization of health services. The uneven geographical distribution of deaths due to this type of causes requires geographically differentiated interventions in order to reduce its occurrence. This set of problems is a major challenge for public administration to achieve an even more pronounced reduction in deaths from ill-defined causes. The continuous search for improvement of health statistics necessarily involves reducing the frequency of deaths classified under this heading.

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